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BY ROBERT SIBLEY.

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BY O. L. WALLER.

ELECTRIC BAKING AT SALT LAKE CITY.

BY G. W. COLE.

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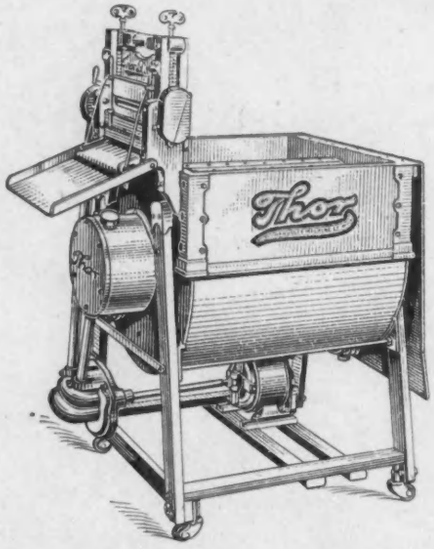

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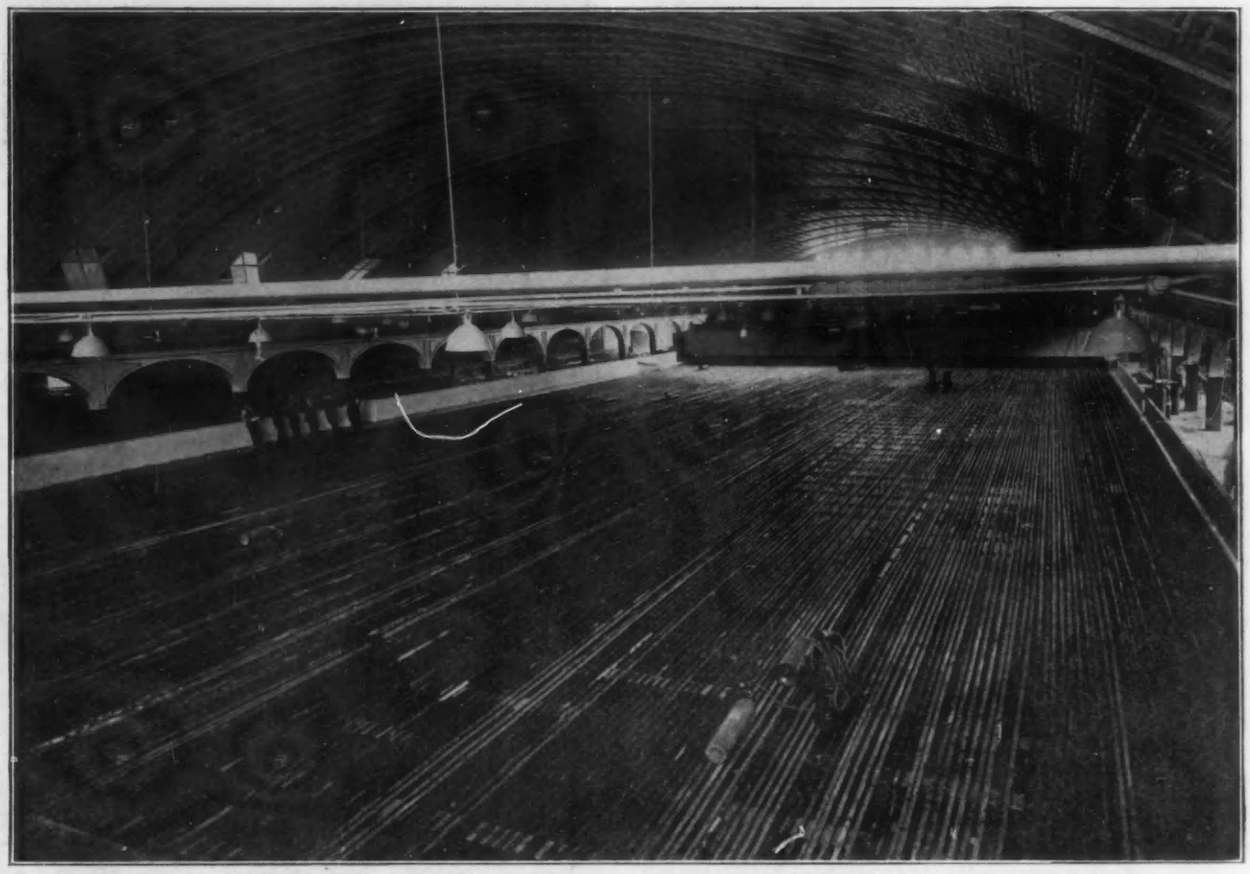
AN ICE PALACE AND ITS TECHNICAL FEATURES

BY ROBERT SIBLEY.

Artificial ice-skating on the Pacific Coast is not only creating a new health-giving, invigorating, pastime for its people, hitherto unacquainted with the joys of winter sports, due to the temperate climate in which they live, but the net result to the electrical industry is an ever increasing profitable power load of almost ideal demands.

The possibility of artificial ice-skating in the West was first heralded and put to a practical test in Portland, Ore., some two years ago. The new pastime proved so fascinating that it rapidly spread to other coast cities. In San Francisco the sport has been especially cordially received by its frolicing, play-loving people.

On October 10, 1916, the new Winter Garden, a huge ice rink with exterior building dimensions of 275 by 144 ft. was thrown open to the public. This building is situated at the corner of Pierce & Sutter streets. On the occasion of its dedication the ice palace was crowded to its limit and it is estimated that in addition some fifteen hundred people were refused admission.



Ten and One-Half Miles of Steel Piping Welded Together for the Formation of an Artificial Ice Pond.

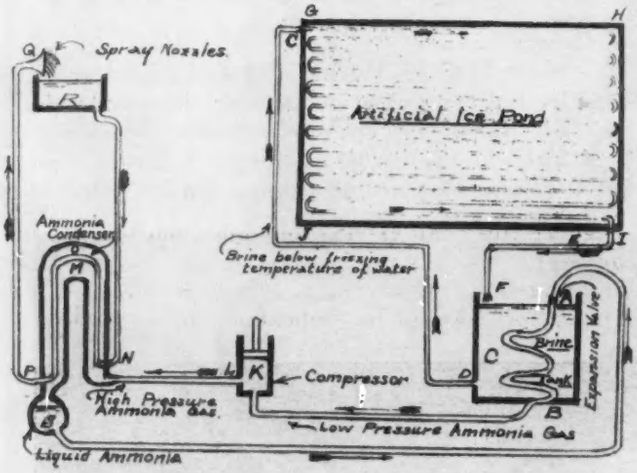
The space devoted to ice skating is of the regulation hocky proportions and measures 210 by 90 ft.

The building has box seats, reserved seats and general admission seats that will accommodate two thousand spectators Surrounding the rink are also to be found dressing rooms, hot and cold showers, a dance floor 100 by 90 ft., and confectionery stand.

An interconnecting telephone system, a carefully appointed system of attendants and ice-skating instructors also add to the comfort and pleasure of the guests.

The Principle of Refrigeration Employed.

The principle of refrigeration employed in preparing the ice pond is that known as the indirect system. In this system liquid ammonia under high pressure is caused to expand into a gas at low pressure in the coils from A to B as shown in the diagram. As in the formation of steam from water, an enormous amount of heat is necessary to be absorbed from the furnace gases, so in the formation of ammonia gas from its liquid, an enormous quantity of heat is necessary to be absorbed from the surrounding medium.



Diagramatic Sketch Showing How the Artificial Ice Pond Is Maintained.

Since brine is made the surrounding medium, as shown at C in the diagram, this extraction of heat from the brine causes the temperature of the brine to be lowered considerably below the freezing point of water. If now this brine be pumped through pipes, DCEF beneath the skating rink, where a thin layer of water—say 1½ to 2 in. in depth is sprayed over the pipe, this water at once becomes frozen and thus furnishes the artificial ice pond, GHIJ for the pleasure seekers.

Reverting to the ammonia that has now been expanded into a gas at lower pressure, let us follow to a conclusion its cycle of operation. The low pressure ammonia gas at B is next drawn into a compressor K and subjected to such a pressure as will cause the ammonia gas to be sent forth at L ready for early condensation back again into a liquid. This compression of course causes the temperature of the ammonia gas to be raised to such a height that it must next be passed through a cooling condenser M. This condenser consists of a series of cool water tubes NOP, which absorb the excess heat from the heated high pressure ammonia gas in M and thus cause the conversion of the ammonia gas into a liquid at S, ready again to be expanded at A, in order to abstract the heat from the brine in the tank C so that ice may be maintained in the rink.

The Artificial Ice Pond Supporting the Throng of Enthusiasts at the Opening Night.

The water cooling tubes NOP, just mentioned, draw their supply of cool water from the tank R, which is fed from the spray nozzles Q on the roof of the building. The heated water, coming from the condenser M at P, is thus exposed to the atmosphere by means of sprays and returns to the coils NOP in the condenser, sufficiently lowered in temperature to permanently effect the necessary absorption of heat from the high pressure ammonia gas in order to convert this gas again to its liquid.

The Construction of the Ice Pond.

The construction of the ice pond proved an interesting piece of work. The building in which the Winter Garden is located, was formerly used as a roller

Snap-Shots of Norval Baptie and Gladys Lamb in Their Thrilling Feats at the Winter Garden Ice Palace.

skating rink. Upon the former skating rink floor was laid eight inches of heat insulating material such as sawdust and water-proof roofing. Upon this was laid a sprinkling of sand, and upon the sand 55,000 ft. of two-inch steel piping. This piping, though remarkable for length, is also remarkable for the fact that it has but 134 joints. These were left to serve as expansion joints. The remaining 4867 connections were done away with by welding the ends together by the oxy-acetylene process.

The Electrically Drawn Ice Planer Preparing the Ice Surface for Skating.

The Capacity of the Refrigeration System.

In the various parts that make up the refrigeration details for this ice rink, practically all units are installed in duplicate to insure continuity of service. The ice plant itself consists of two 50-ton units, each operated by electric motors of 100 h.p. capacity. 2500 gallons of brine, composed of a 75 per cent solution, are used in the circulating system for creating the artificial ice pond. The average quantity of brine circulated per minute is about fifteen gallons. This is, however, carefully regulated, so that the temperature of the ice in the rink is kept as nearly 32 deg. F. as possible since this temperature of freezing water has proven best for maintaining a smooth surface of the ice.

It is found necessary to trim the ice three times daily in order to maintain the surface absolutely smooth. This is efficiently accomplished by means of an electrically drawn ice planer as shown in the diagram.

The ice pond is well lighted by means of some 1200 lamps of 150 c.p. capacity which are evenly distributed over the skating area. Throughout the building there are in all over 2000 lighting outlets.

The compressor and refrigerating machinery were installed by the Cyclops Iron Works of San Francisco; the piping was furnished, welded and laid by the Pacific Pipe Company of San Francisco; the electric truck for drawing the ice planer by the San Francisco branch of the Edison Storage Battery Company; and Mr. J. T. Ludlow, a consulting engineer of San Francisco, acted as architect and engineer for the complete installation.

COST OF PUMPING FOR IRRIGATION.

BY O. L. WALLER.

(This interesting paper sets forth in clear, concise language the yearly operating costs of irrigation pumping, particularly as relates to conditions in the Inland Empire of the Northwest. The paper is taken from Popular Bulletin No. 104 as published by the Washington Agricultural Experiment Station. The author is an irrigation engineer of Pullman, Wash.—The Editor.)

The office of the irrigation engineer receives hundreds of letters each year asking for information about pumping plants and the writers of these letters all want to know if pumping under their particular conditions can be done profitably. It has seemed to the writer that many of the inquiries could be answered by a general bulletin. Consequently the purpose of this bulletin is to provide an answer to as many of these letters as possible by selecting a problem and solving it. In making up data we have kept in mind the results actually secured by the farmers. In many instances the actual working results fall far short of those claimed by the manufacturers of pumps and engines. Pumping plants installed on farms are usually not operated by expert machinists and consequently cannot be expected to give results equal to manufacturers' ratings. Farmers, buying pumps and engines should keep this in mind.

From the many problems received we may select the following: A farmer wants to irrigate 80 acres of sandy loam soil with a total pumping lift of 65 feet. What will be the probable cost per acre per year; first cost of plant, operating charges, depreciation, taxes, interest on first cost, etc., being considered?

The answer to all of these inquiries will depend largely upon the amount of water used. The amount of water needed to successfully grow crops will depend on the kind of crop raised, the kind of soil upon which the water is used, the temperature and wind conditions, the distributing system, the character of the cultivation, etc.

When the farmer, knowing his local conditions, has made up his mind as to about how much water will be needed per acre, and the number of acres to be irrigated, the product of the number of acre feet of water needed per acre by the number of acres to be irrigated, will give the total amount of water to be pumped during the irrigation season, of about four months or 120 days. Practice has shown that about one-third of this amount will be needed during the hottest month. Taking one-third of the total season's requirement, as the amount to be pumped during the hottest month, dividing this amount by 30, we find the number of acre feet to be pumped each day. The latter figure divided by two will reduce the amount required to cubic feet per second and finally if the number of cubic feet per second is multiplied by 450 the result will be the number of gallons per minute to be pumped, pump operating 24 hours per day. Knowing the number of gallons per minute to be pumped a pump catalogue will give the size of the pump. Having thus determined the size of the pump required we will next find the amount of power needed to do the pumping.

In the above we found the number of cubic feet per second required. Multiplying this by 0.1135 and

by the lift in feet (including measured lift, friction head lost in the delivery pipe, suction lift, etc.) will give the theoretical horsepower. The actual power required to do the pumping for small plants ranging from 10 to 15 horsepower will be about three times this theoretical amount; for smaller plants more than three times this amount will be needed, and for larger plants less than three times will be needed. This is based on the joint efficiency of motor and pump or engine and pump, as the case may be, and when both are working under average farm conditions.

Assuming that you are expecting to buy either a gasoline, distillate or oil engine then you will want to know how much gasoline, distillate or oil will be needed to do your pumping. If this factor were known you could find out from the oil company the cost of the season's supply.

A careful study of the literature giving cost data on pumpng plants reveals a wide variation in power costs. All available data were examined and platted for the purpose of determining how much gas, distillate or oil was used under actual farm conditions to pump one acre foot of water one foot high and from these data the attached table No. 1 was made up. It

Table I.

Table showing gallons of gasoline, distillate, or crude oil used, under average farm practice, to lift one acre foot of water one foot high.

	Engine belted to a centrifugal pump.		Engine belted to a deep well pump.	
Horsepower.	Gallons.	Efficiency of plant.	Gallons.	Efficiency of plant.
2	1.14	.15	1.8	.10
3	.94	.18	1.2	.15
4	.83	.20	.91	.19
5	.76	.23	.79	.22
6	.70	.26	.70	.25
7	.66	.27	.63	.27
8	.62	.28	.58	.30
10	.58	.29	.53	.33
12	.57	.30	.49	.35
15	.55	.31	.45	.38
20	.51	.34	.40	.43
30	.45	.38	.33	.52
25	.48	.36	.36	.48
35	.42	.41	.29	.60

will be observed that small pumping plants used much more fuel in proportion to the work done than large ones. In other words it costs more for fuel to lift an acre foot of water one foot high with a small plant than with a large one.

Some of the cases studied showed that the pumping plant was too big for the job and considerable fuel was wasted in turning over a big engine and pump for a small amount of water, or it might have been so big that it was only operated for a few hours per week. It is not economical to run an engine at light load. Many of the engines used for irrigation pumping are too large for the service they are required to render. In such cases the interest on the investment is large, the depreciation charges and taxes are much heavier than they would be on a properly sized outfit. Motto: Buy as big as you need, but no bigger.

The plant should be designed for the maximum service during the hottest month and it should not be larger than is necessary for this maximum service. Whenever it is in operation it should be run up to its rated speed or in other words, it should be required to deliver water at its maximum capacity.

Several hundred tests have been run on small pumping plants in the United States (most of which were in use for irrigation) to determine their performance. These data have been published and are available to any one wishing to make a study of them. A class in irrigation engineering in the State College of Washington spent some time plotting the data contained in these published reports and in deducing the attached table of gas and oil consumption required to lift one acre foot of water one foot high. This table shows actual performance of pumping plants in operation on farms. These averages include good outfits and poor outfits. If you put in a poor and improperly designed plant you should not expect to get as good results as the table shows. If you put in a good plant, one designed for your particular service, you may expect better results than those here shown.

If you expect to use a centrifugal or turbine pump you should know the exact pressure gauge head under which it is to be operated. And in no case buy a stock pump unless said stock pump is designed for your particular lift. Buy a well made pump, one that has a record for high efficiency, and that has stood up under service, that has required a minimum of repairs, and that continues to deliver water up to its rated capacity, and then you must give it good care if you expect it to be economical. It is not the purpose of this bulletin to discuss the mechanics of the above statements, but it is enough to say to the farmer that unless the pump is well built and designed for his particular pressure gauge lift, it will waste power and consequently waste his money.

Problem—To determine the amount of gas or oil required to irrigate 80 acres under a 65-foot lift, water to be pumped with a centrifugal pump, belted to a gasoline or oil engine:

From the character of the soil, climatic conditions, etc., we must determine how many acre feet of water will be needed for each acre of land. An acre foot is the amount of water required to cover one acre one foot or 12 inches deep. The whole amount needed for the season will be arrived at by multiplying 80 acres by the number of acre feet per acre required. In this case we will assume that the land will require three acre feet per acre or the equivalent of 36 inches of rainfall during the growing season. Then 80 multiplied by 3 equals 240 acre feet of water needed for the growing season. If this is multiplied by 65, the number of feet that it must be lifted, the result will be 15,600 acre feet feet. An acre foot foot may be defined as one acre foot of water lifted one foot high. Then 240 acre feet of water lifted 65 feet onto the land to be irrigated will give 15,600 acre feet feet. This multiplied by .54 gallons, the amount of gasoline or oil which farm practice has shown will be required to lift one acre foot of water one foot high, will give 7,800 gallons for the season's run. The one-half gallon of gasoline used in this last multiplication was taken from the table and is the amount of gasoline or oil that a 25-horsepower engine would consume in lifting one acre foot of water one foot high. Having thus determined the amount of gasoline or oil required for the season's run, and knowing the market prices it is easy to arrive at the cost of the fuel used.

To this must be added the yearly depreciation on the plant, interest on the cost of same, time of man required to run the pump, cost of oils, waste and repairs. When all these items are determined and

added, the total cost per acre for water can be arrived at by dividing this grand total by the number of acres irrigated.

The prices of gasoline, kerosene, distillate and heavy oils vary so much in different localities that it seems best to estimate the amount used and leave it to the prospective user, knowing the market price for such product, to make his own estimate of cost.

In selecting a pump and motor of the right size, for the problem stated, it may be assumed that one-third of all the water to be used during the season should be used during the hottest month or that 80 acre feet must be pumped in 30 days or that the pump must handle 1 1-3 second feet. This would require a pump lifting 600 gallons per minute, and operating 24 hours per day. A well constructed No. 5 pump running at proper speed will deliver that amount of water. In passing it is safe to say that centrifugal pumps are generally over-rated and that they usually do not deliver the amount of water they are supposed to deliver. In installing a pump this fact should be kept in mind and the manufacturer should be required to guarantee the delivery of the pump and the over all efficiency of the plant, and the plant should not be accepted and paid for until a test has been run to see that the guarantee has been fully complied with. A plant that does not give a high efficiency and maintain it, is wasting your money. The theoretical horsepower required would be secured by multiplying 1 1-3 cubic feet per second by 65, the lift in feet, and this product by the constant 0.1135 which gives 9.88. A 25-horsepower engine will therefore be selected, which is rather smaller than Table I calls for.

If you are about to buy a pumping plant for irrigation purposes it will pay you to visit several plants in operation—some using distillate or oil and some using electricity. You should study pumps as well as engines and motors. You want an outfit that will deliver its rated amount of water continuously, one that is simple and that is easily kept in order and one upon which the operating expenses do not continually grow larger.

Tests have repeatedly shown that each centrifugal pump has its highest efficiency at some particular speed and that it costs more to operate them at a higher or a lower speed. When a pump has been tested and the speed of its highest efficiency determined it should then always be run at that particular speed.

The belt should be wide enough and long enough to do the work, and should be kept in good repair and tight enough so that it will not slip. The foundation for pump and motor should be large enough and strong enough to eliminate vibration.

The efficiencies shown in the table for gas or oil engines, belted to centrifugal pumps, are based on field practice. They are not based on the thermal efficiency of the gasoline, distillate or oil, but rather upon the manufacturer's estimate of one pint of oil or distillate per horsepower hour. In making up the efficiencies the actual amount of distillate or oil used to pump one acre foot of water one foot high was divided by the theoretical amount usually given as sufficient to do that amount of work. This column of efficiencies is only given to help the purchaser in selecting an engine of proper size and for that purpose it is sufficiently accurate. The efficiencies shown in this table are somewhat higher than those given by some of the investigators, but it is thought that under reasonable conditions they could be attained. Engines and pumps now sold are generally better designed and more efficient than they have been before. If proper sizes are selected (the pump designed for the particular head against which it is to operate), good, solid foundations put under the machinery and all kept in reasonably good working order, these efficiencies should be easily secured.

From the annual report of the office of Experiment Stations of 1908, I quote the following:

"Gasoline engines included with both centrifugal and deep well pumps were delivering about one-fourth their rated capacity, while the electric motors were delivering 31 per cent with centrifugal pumps and 47 per cent with deep well pumps. In other words, in ordinary field practice, rated capacities of gasoline engines are about four times the useful work done, computed from the weight of the water lifted and the measured lift; and the rated capacities of the electric motors used for operating pumps are about three times the work done, computed the same way."

On account of the fluctuations in the materials market, a list of prices on engines, motors and pumps would be out of date before it was published. However, from prices quoted by engine manufacturers, a 25-horsepower crude oil engine of substantial type, installed, would cost about.....$1050.00

A pump, designed for high efficiency and low upkeep, installed, may be estimated at... 650.00

Belt 25.00

Cost of plant.....$1725.00

Operating Costs per Year.

7800 gal. crude oil, 28 test at 5c	$390.00
Cylinder oil	35.00
Interest, depreciation and taxes, at 20 per cent	345.00
Attendance, 2 hrs. per day, 120 days, at 40c per hr	96.00
Repairs each year, estimated at 2½ per cent	43.00
Hauling fuel oil 5 miles, estimated	45.00
Total operating costs	$959.00
Cost per acre per season	$ 11.90

If distillate, at about 13 cents per gallon, were used the cost would be materially increased. As estimates of cost are usually made there is a disposition to consider only the cost of the gasoline, distillate or oil used and to omit all the other items which are quite as much a part of the real cost of pumping as is the fuel charge.

The item of attendance must not be omitted. A good outfit will require less attention than a poor one, but any plant that is kept in good working order and that works economically will require considerable attention.

A gentleman who has had considerable experience with gas engine pumping plants, says:

"The man who thinks he can install a gas outfit and that he can go away and leave it and that it will always work all right until he comes back in a couple of hours, has another think coming as it may and it may not do it."

The same gentleman recommends one of the very

best made pumps and further says that a "centrifugal pump made by the ordinary foundry or machine shop is only a guess at the best and is not worth the iron that is in it."

The pump should be set close to the water, using only a short suction lift, and the discharge pipe should be large enough to keep the friction losses low. A reasonably large discharge pipe is more economical than pumping against a high friction head.

Through the courtesy of the Pacific Power & Light Company the writer has had access to all the notes and data connected with tests run by that company on about 150 electrically driven pumping plants in Washington in the year 1912. These data in conjunction with a large number taken by the U. S. Department of Agriculture and by some of the western experiment stations were used in making up Table II. The plants were generally made up of centrifugal pumps directly connected with electric motors. The data concerning some of them, having very bad pumps, which were later discarded, were not included in making up Table No. II.

Table II.

Table showing kilowatt hours of electric current used under farm conditions to pump one acre foot of water one foot high.

Induction motor directly connected to a centrifugal or turbine pump.

Horsepower.	Kilowatt hours.	Per cent of Efficiency.
2.5	3.25	.31
5	2.85	.35
7.5	2.50	.40
10	2.35	.42
15	2.20	.45
20	2.05	.49
25	1.90	.52
30	1.80	.55
35	1.70	.59
40	1.65	.60
50	1.60	.62

This table shows the number of kilowatt hours required to pump one acre foot of water one foot high and the third column shows the mean efficiencies. The efficiencies are higher than those secured in gasoline engines and centrifugal pumps.

Le Conte and Tait state that, as a rule, the plant efficiency for the electric pump is definitely higher than for a corresponding plant operated by gasoline.

Elwood Mead says: "The conditions are so varied in different localities that no fair decision can be reached as to which of these forms of power is preferable, but the most general statement, which must be taken with many qualifications, is as follows: When electric power is obtainable, it is best. It is quite certain that of all forms of power available for pumping, the electric motor driven plant will require least attention.

Smith, of the Arizona Station, says: "Where electric power is available, pump and motor should be directly connected on the same bed plate. Such a plant requires the very minimum of attention."

A 20 horsepower electric motor directly connected to a first class turbine pump, installed on a good concrete foundation, all wired and housed and ready to operate, will do the work called for by this problem, and will cost about $1000, and will require approximately 32,000 kilowatt hours for the season.

Operating Costs per Year.

Based on the Pacific Power & Light Company's rates the cost of this current will be approximately	$526.00
Interest on investment at 8 per cent	80.00
Depreciation at 8 per cent	80.00
Taxes, 2 per cent	20.00
Cylinder, oil, fuses, etc	20.00
Attendance, 1 hr. per day for 120 days, at 40c per hr	48.00
Total cost of operating	$774.00
Cost per acre irrigated	$ 9.70

These estimates are based on three acre feet per acre. Some porous, sandy lands may require more than that and some of the better soils may use less. This particular number was selected in order to have a basis upon which to make up an estimate.

If you expect to pump water for irrigation you should settle upon the amount of water needed per acre, the size of the plant required, the quality of machinery desired and then through the machinery houses make up an estimate of the cost of the plant to be installed and all ready to run. When this is done an estimate of the cost of a season's operation should be made about as estimated in this bulletin. With this data before you, if a margin of profit warrants the venture, buy the outfit and give it a first class installation. On the other hand, if your estimate shows a probable loss or you think the crops to be raised can not be sold for enough to pay for pumping the water, for your time, and a reasonable profit on your investment, then you better let it alone.

The pumping plant when installed should be tested and adjusted to operate at its highest efficiency. The amount of gasoline, distillate, crude oil or electric current used and the amount of water actually delivered should be determined and the total pressure gauge head measured. With this data the farmer will know what it is costing to irrigate his farm. Many a failure has resulted from the installation of a poor outfit, and a neglect to figure in all the items of cost.

Irrigation practice in Growing Small Fruits in California, by Wells A. Hutchins, is the title of Circular 154 recently issued by the California Agricultural Experiment Station. Such fruits require irrigation at frequent intervals during at least part of the season, a condition which is particularly satisfied by pumping plants, as stated in the bulletin. "The water supply for berry irrigation must be a dependable one throughout the dry season and particularly while fruit is being produced. This applies in greater measure to strawberries than to other small fruits because bush-berry plants are the more drought resistant. Only small quantities of water are needed for strawberries at anyone time, but it is needed often, and the lack of water for a protracted period during the summer may prove fatal to the plants or at least impair their crop producing powers for another season. Hence the commercial strawberry grower whose field is located under a canal system with erratic water supply often needs to supplement such supply with a pumping plant. As a matter of fact pumping plants furnish most of the water used in the large berry centers of California. They are usually small plants, for the acreages and heads of water used are small." The preparation of the land for irrigation, methods of distribution of the water, planting arrangements and the application of water to strawberries and bush berries are described for the sections of the state where these products are of importance.

ELECTRIC BAKING AT SALT LAKE CITY.

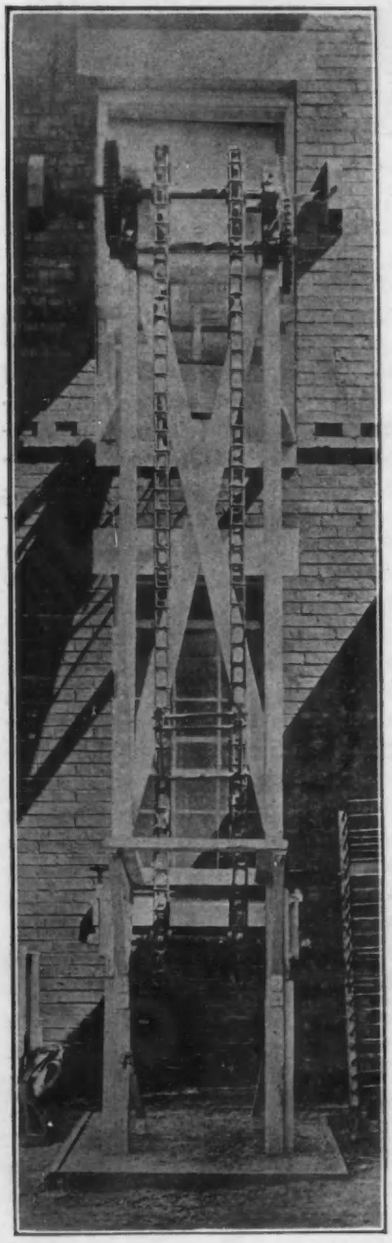
BY G. W. COLE.

(Detailed description is here given of a bakery where 18,000 loaves of bread are daily made, baked and handled by electricity. Current is supplied by the Utah Power & Light Company, from whose Bulletin this story is reprinted.—The Editor.)

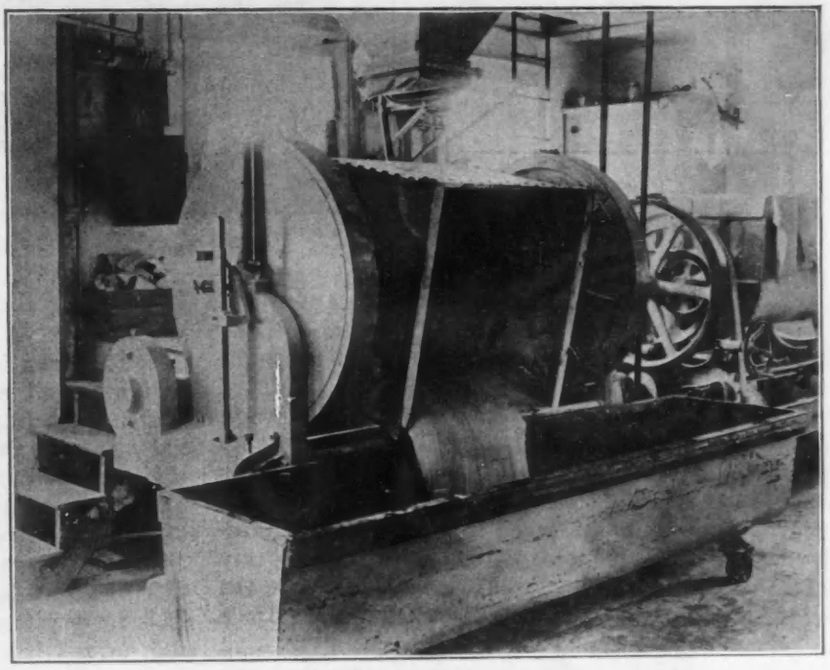
Probably the most complete electrically equipped bakery in the world has just been installed at Salt Lake City by the Vienna Baking Company. From the time the flour is unloaded until the wrapped loaf is in the cooling room, electricity performs the major part of each operation.

When the dray bringing the flour from the mill backs up to unload, an electrically driven flour elevator lifts each sack to the second floor, where it is stored in a large storeroom with a capacity of approximately five carloads of flour.

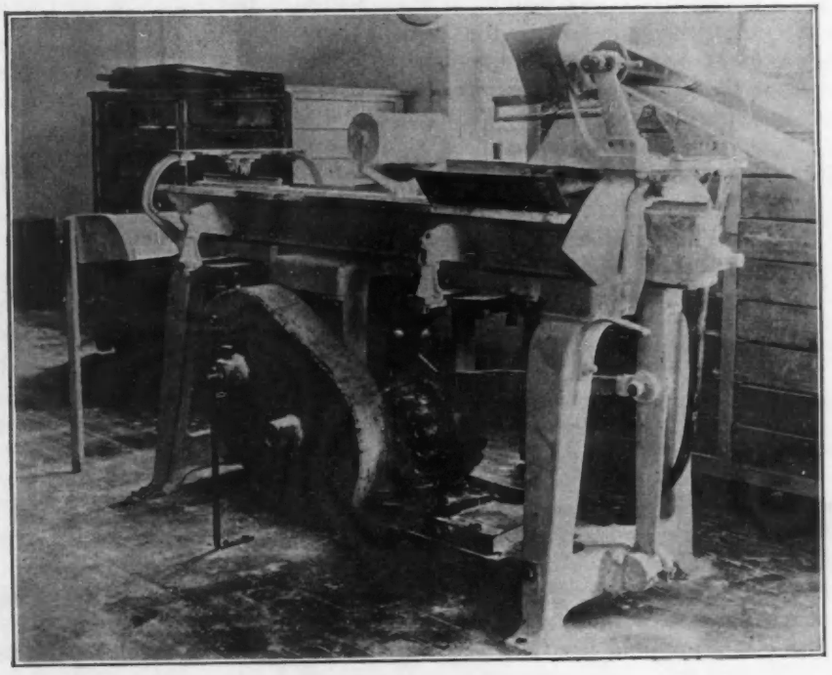
The first operation in the bread making process is to pass all flour through a sifter into the storage bins. From this point it passes into the high speed mixer, which is driven by a 20 h.p. General Electric motor. The use of a high-speed mixer has several advantages over the old style mixer. More air is whipped into the dough, giving it a greater rising power. More water can be added to the mixture, giving an equal consistency to the finished dough. Less yeast is necessary to give a full spring; on account of more air being whipped into the dough, a whiter bread is ob-



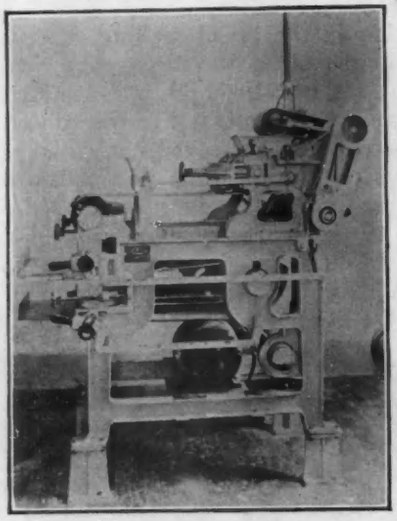
Automatic Flour Elevator.



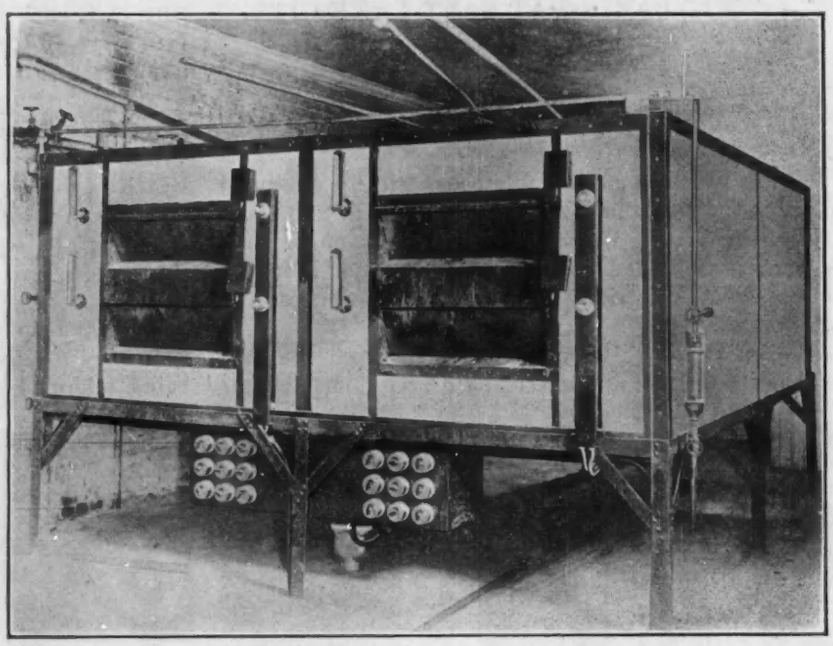
High-speed Dough Mixers and Dough Trough.



Dough Rounder.



Loaf Moulder.



Hughes Electric Oven at Vienna Bakery.

tained after baking. This mixer has a capacity of about 800 loaves per mix, and can turn out about 1000 loaves per hour. As the dough is turned from the mixer, it is put in dough troughs, where it is allowed to remain five hours, while the yeast does its work, and fills the trough full of a soft billowy-like smooth textured dough. After about four hours in the trough, the dough is "worked down" and allowed to "raise" again for about an hour, when it is ready for the scaling machine. Great pieces of dough, weighing forty or fifty pounds, are dropped into the scaler, where the loaves are weighed and cut off automatically, by a cubical contents process. There will not be a variation in the weights of the pieces of dough, of more than one quarter of an ounce, during the entire run. This scaler can be adjusted for any weight of loaf desired. The dough, after dropping onto the endless belt of the scaler, is carried to the rounder, where it is rolled between two aluminum bars, which have practically the same motion as if the dough were kneaded by hand, and finally drops into a receiver, as a small round ball of dough. Both of these machines are motor driven, and automatic in their operation.

As the balls of dough leave the rounder, they are put in proof boxes, where they remain for forty to fifty minutes, to allow the yeast to spring and give life to the dough.

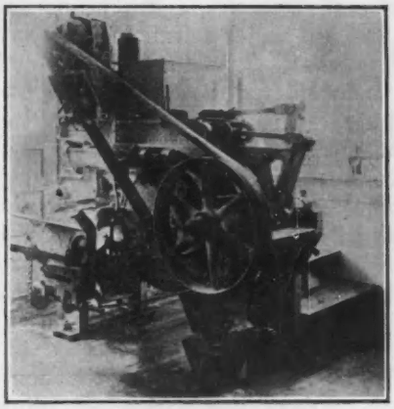
After the dough has begun to lighten somewhat, it is put through a motor driven moulder, which is nothing more than a stationary belt, with a revolving belt passing just above it. As the dough passes along between these belts, it is rolled into a cylindrical shape about two inches in diameter, by eight inches long, two of these pieces being put in each pan, to make a ten-cent loaf of bread. As the pans are filled, they are put in pan racks, three ten-cent loaves to a pan and seventy pans to a rack, after which the rack is put in the steam proofing box, where the dough is allowed to raise until the proper spring has been reached, when it is sent to the largest electric bread baking oven in the world.

The oven is of double deck construction, with a dividing wall running perpendicularly through the center, from front to back, making four separate compartments in the oven. Each compartment will hold thirty-seven pans of three ten-cent loaf capacity, or one hundred eleven ten-cent loaves. The total number of ten-cent loaves that can be baked at once is 444, or as the bakers rate the capacity of an oven, it will bake 888 five-cent loaves at one time, or approxmately 25,750 every twenty-four hours. This, compared with the largest brick oven in the city, which holds 600 five-cent loaves, shows the relative size of the ovens.

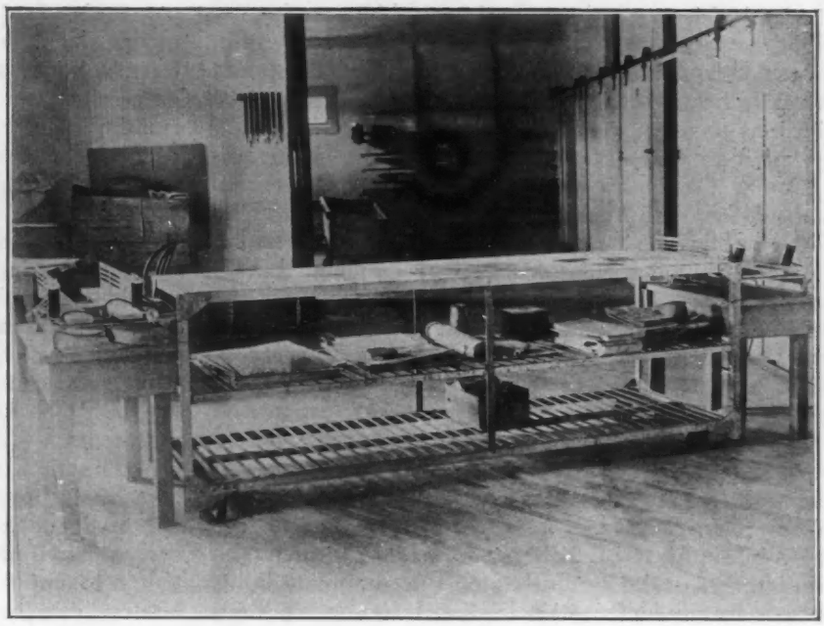
The oven can be filled in about four minutes. To operate it requires little attention, as the heat is supplied from below and from above in each deck. Each section is divided into three parts, each controlled by a three-heat switch, giving to the oven a great variety of heats.

In baking yeast-leavened bread, best results can be obtained by having the oven at 550 deg. F., when loaded, and then allowing the oven temperature to fall until just before unloading, when more heat should be applied to brown the loaf. In baking soda or baking powder breads, the reverse should apply. Put the dough in a moderate oven and increase the heat.

In baking the 22-ounce or ten-cent loaf, about forty minutes is required to thoroughly work the dough. If left in less than this time the loaf is not thoroughly cooked. If left in longer, the moisture is dried out and weight is lost. Repeated tests have shown that with 550 deg. F. at the start, the bread will be at its best after forty minutes baking. It requires about four minutes to unload the oven, making a total of forty-eight minutes required to load, cook and unload the oven. With a few minutes allowed to bring the heat up again, 888 loaves of bread can be turned every fifty minutes.



Automatic Dough Scaler and Cutter.



Electric Wrapper and Sealing Machine.

The construction of this oven is similar to other Hughes ovens. It is finished in galvanized iron, with white enamel front. One standard size door to each compartment. Each compartment has an individual thermometer and steam jet. It is fitted with one and three-quarter inch tile decks and four-inch insulated walls. The heating units are of the open coil type, wound on non-conductor cores.

The rated maximum demand of this oven is 75 kw., but our charts show an actual demand of 88 kw.

The bread, as it is taken from the oven, is put in racks and allowed to cool before going to the bread wrapping machine. The cool loaf is wrapped in a waxed wrapper and run through an electrically heated sealing machine, which heats both ends of the loaf, causing the wax to melt enough to seal the wrapper. These heaters operate with about 250 watts each.

As the bread is pushed from the wrapping machine it is stacked on long boards, holding thirty-six loaves. These boards are then carried to the bread rooms, where they are stored for the morning delivery. At about 5 a. m. the auto delivery flotilla starts out with the early morning orders, each man handling from one thousand to fifteen hundred loaves per day.

The total output in various kinds of bread for the sixteen-hour run totals eighteen thousand loaves per day.

One of the peculiar things that has resulted as a consequence of making an up-to-date bakery, is the increase in business. The output formerly was ten thousand loaves per day from three brick ovens. With the advertising of electrically baked bread, the demand jumped to fifteen thousand loaves over night. There has been a steady demand for the product, until at present the output is eighteen thousand loaves per day and as the baker said, "All sold out."

This modern bakery has been taxed to its capacity to keep up with its demand for electrically baked bread. The housewife has learned the superiority of electrically cooked foods over those cooked otherwise.

MAKING PUBLIC SERVICE BONDS LEGAL INVESTMENTS FOR SAVINGS BANKS.

With their usual keen insight into the future, investment bankers are already seeing the time approaching when properly secured public service corporation bonds will take their place among the selected class of securities in which savings banks may legally invest the savings of their depositors. Expecting this development from the change now going on, the bankers are wisely taking time by the forelock and planning suggestions and recommendations to provide a safe basis whereby public service bonds may enter this aristocratic circle of securities.

Once the barrier is broken down a remarkable impetus to the sale of these securities should set in, for then they will stand on the threshold of a new field, which up to the present has not even been scratched on the surface and which also is capable of absorbing millions of such accounts annually.

All changes come through evolution. Not so long ago little hope was entertained by dealers in public service corporation bonds that state laws could be so amended so as to bring their offerings within the purview of legal bank investments. As long as the majority of securities already legal for savings banks deposits were selling in the market on an income yield which did not make these institutions strain their efforts to produce interest sufficient to take care of their overhead expenses, reserve requirements and pay their depositors from 3½ to 4 per cent, there was little incentive to look around for additions.

But in some states, especially in the Eastern section of the country, a radical change has occurred. By making certain bonds exempt under the income tax and by the rapid accumulation of available loanable capital, bond prices have mounted to such high figures that the income produced hardly makes them attractive for savings banks and they face the need of finding other avenues of investment which will provide them with the necessary margin in income.

Backed by a consistent and favorable record many public service corporation bonds which come within the regulations making them legal investments, should naturally have the first call wherever the states make additions to the list of savings banks securities.

Such an outlook made the investment bankers in session in Cincinnati listen with the closest attention to the report read them by John E. Oldham, chairman of the public service corporation committee, wherein certain rules and regulations were recommended making public service corporation bonds eligible for the funds of the poor man's institutions. At the same time the committee also recommended a more standard form of mortgage to replace the verbose legal one now so much in use and which the average investor no more understands than the Koran unless tutored in the language in which it is written. Investors will commend this recommendation most heartily; may this reform come quickly.

While no law could be so framed as to meet the requirements of the various states, the committee holds that certain fundamentals providing safety to investors could be devised which would go far to help state legislators in their efforts to frame legislation suitable to what they consider their special requirements. This becomes necessary as conditions are not alike in different sections of the country. The committee holds that the face value of securities should not exceed the investment value of the property to make them eligible and that the net earnings should exceed the amount of interest. There is no disagreement on this score or with the further conclusion that in both instances, in the value of the property and in the earnings there should be a considerable margin over the secured creditors' obligations as a buffer to prevent financial default, and if it is unavoidable there remains the recourse of calling upon the junior security holders for funds to protect their investment.

Investigation by the committee leads it to the conclusion that for the purpose of rate making the value of the property has been estimated on the basis of from $4 to $5 of property value for every dollar of gross income. So if a property earned annually a gross of $100,000, the value of its property would be placed anywhere between $400,000 to $500,000. Out of the gross earnings there should be earned from 40 to 30 per cent, for the net, which in the first instances would produce out of the $100,000 gross the sum of $30,000, and in the latter instance $40,000, against which earnings bond issues could be created whose interest requirements and other provisions, such as sinking fund needs, would come well within the net earnings. Such a basis of calculation would provide a good starting point in establishing the legal standard for public service bonds. It is also provided as an additional measure of protection in many of the states that the operations and finances of these corporations be under the supervision of state control. After careful consideration the committee decided that bonds returning a net equal to 1¾ times the fixed charge, offer a fair margin of safety and that gross earnings equal to four times the fixed charges, offer sufficient evidence of a property value in proportion to the amount of bonds.

In regard to the class of public service corporation bonds eligible for savings banks, the committee believes for the present they should be confined to the companies furnishing artificial gas, electric light and power, local transportation lines and telephone and telegraph lines, but that no power company producing power for only a few manufacturies, a jitney line not running over tracks and not under a franchise, or any company under the process of construction, should be included, because it considered them as yet too unseasoned; likewise only companies operating in the United States are recommended.

Other minor recommendations are made treating of the franchise requirements, character of bonds, treatment of earnings of corporations. The committee suggested a clarity in the financial reports issued to aid state banking superintendents to determine eligibility of public service bonds as institutional investments.

The committee invited discussion among the members of the investment bankers' association regarding the kinds of companies to be included, size of such companies, limitation of states having utility laws, attempt to impose franchise requirements, exclusion of holding companies, attempts to impose requirements as to maintenance and depreciation, inclusion of senior securities of companies of inferior credit, requirements as to safeguards for escrow bonds, length of time for qualification, and amount of work imposed upon bank commissioners.

In arousing thorough discussion that will bring forth concrete ideas as to how these important matters may be handled, the Investment Bankers' Association will fortify itself to lend valuable assistance to the various states which will at some time in the near future find it expedient to revise their legal requirements governing investments by savings banks and embrace public service corporation bonds.—The Financial World.

PLAN TO FLOOD LIGHT STATUE OF LIBERTY

The Statue of Liberty, gift of the Republic of France to the United States, will be illuminated for the first time with its new permanent flood-lighting on the night of December 1st, according to a program just announced by the Society for Electrical Development. Through the activities of the society, in co-operation with the New York World and with leading government officials and electrical engineers, plans have been made to lay a cable from the New Jersey shore to Bedloe Island, which will carry current for the illumination. This will provide all Bedloe Island, where the statue is located, with central station service instead of the isolated plant as was originally proposed.

This installation will endure as a national exhibit of central station service and, in a picturesque way, be an inspiration for flood-lighting civic buildings, arches, statuary, etc., throughout the cities of America. In furthering this project, the society's general manager, J. M. Wakeman, has addressed letters to all the 268 America's Electrical Week committees earnestly requesting each committee to set aside Saturday, October 28th, as "Liberty Day." This date is the thirtieth birthday of the Goddess of Liberty, and it will be the last day upon which donations will be received to flood-light the statue. Electrical engineers will begin the installation directly after so that the AEW inauguration may be run off according to the society's program.

SPARKS—CURRENT FACTS, FIGURES AND FANCY

"The only form of price-fixing which is right—the fixing of prices by each concern at a level which shows sure profit, based on absolute knowledge of what everything costs."—James H. Collins.

* * *

Over 97 per cent of all possible customers within 300 ft. of the Utah Power & Light Company's lines of less than 11,000 volts are using that company's service. The load builders are now going after the other three per cent.

* * *

Preliminary work has been started by the Union government on the Hartebeestpoort irrigation scheme in the Transvaal, South Africa. A concrete dam 159 ft. high is to be constructed so as to store five million cubic feet of water.

* * *

The railways of the United States have a debt of ten billion dollars and the stock amounts to about six billions. Net returns for the last fiscal year, though the largest in history, were equivalent to about 5½ per cent on the property used by the public.

* * *

In the great game of business only eighteen per cent failures are due to causes outside the business itself. The other sixty-five per cent can be definitely traced to incompetence, lack of experience, insufficient capital, lack of personality or bad habits.

* * *

Football is the latest outdoor sport to be electrified. The Harvard Stadium is to be flood-lighted during varsity practice in the late afternoon. At a preliminary try-out a battery of eleven lighting units furnished sufficient foot candles for the squad of eleven football players.

* * *

"Of all the inventions, the alphabet and the printing press alone excepted, those inventions which abridge distance have done most for the civilization of our species. Every improvement in the means of locomotion benefits mankind morally and intellectually,"—Lord Macaulay.

* * *

The Electrical Supply Jobbers' Association has postponed action indefinitely on a plan to form eight geographic sections which were to meet locally at frequent meetings and nationally at semi-annual conventions. It is probable that objection to this plan will be removed in the near future

* * * *

The next step in the evolution of public utilities, in the opinion of W. W. Freeman of Cincinnati, will be into an era of recognition. They have already passed through the stages of invention and exploitation and are now in the age of regulation The utility has learned that its first function is to be a faithful public servant and the people are beginning to realize that there is an equally strong duty on the part of the public to permit the utility a fair and reasonable return for the service rendered

Electricity is being rapidly adopted throughout China. The present high price of kerosene makes electric lighting economical and motors are displacing manual labor in many small factories. The mint at Mukden is the first to adopt the use of electric power.

* * *

The crop of newly-fledged valuation engineers and rate experts who offer to obtain reductions in rates for electric service on the basis of payment proportionate to reduction are a species of highwaymen whose practices are hard to curb. An enlightened public opinion seems to be the best remedy.

* * *

The largest dam in Europe has just been completed by American engineers across the chasm through which the Noguera Pallaresa River flowed near Barcelonia, Spain. It is a concrete structure 330 ft. high, 700 ft. long, 230 ft. thick at the base and 14 ft. thick at the top. The water is used for power and irrigation.

* * *

The possibilities of using electric railways in plans for coast defense were explained at the annual convention of the American Electric Railway Association by W. K. Wilson, captain of the Coast Artillery Corps. Guns mounted on cars could be used to prevent a landing at unfortified places and many supplies can be quickly transported to fortifications by electric railways.

* * *

Present shipments of California crude oil exceed production by over a million barrels a month. Since July, 1915, the stock has steadily lessened from sixty million to less than fifty million barrels. In this same period the price of heavy crude oil at the wells has more than doubled, now being close to eighty cents. The seven thousand operating wells in the state are producing about eight million gallons monthly.

* * *

"Organization is based on the division of aggregate effort into parts and the selection of persons who have a special fitness for the performance of each subdivision of the work. Sumner expresses this idea when he says, 'Combination is of the essence of organization; an organization is the great device for increased power by a number of unequal and dissimilar units brought into association for a common purpose.'"

* * *

The largest order ever placed for a single commodity was the sale recently of 448,000,000 pounds of copper to Europe, with deliveries during the first six months of 1917. This copper was sold at from 26 to 27 cents a pound, the transaction involving a total outlay of about $125,000,000. The order will call for about one-quarter of this country's entire refining output of metal during the first six months of next year and makes altogether 900,000,000 pounds of copper that has been taken in the United States for the account of foreign buyers.

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Engineering: A Profession or A Trade?

Engineers are anxious that their calling be recognized as a profession. They desire public appreciation of their work. But sometimes they fail to realize the criterion by which they must be judged.

The so-called learned professions, theology, law and medicine,—have the unselfish service of mankind as the basis of their claim to this distinction. If a physician practices merely for the money there is in it, strictly speaking, he is not a professional man. Lawyers, doctors and even ministers decry the tendency of their professions to degenerate into trades. In the minds of most people the law has already tumbled from its pedestal. There are still many doctors, however, who are devoting themselves to the good of mankind and the great majority of ministers are above suspicion in this respect.

Engineers, as a group, conform well to this high standard for a profession. They are deeply interested in their work for its own sake and not for the money there is in it. They have set up a code of ethics of the highest grade and they are thoroughly imbued with the idea that their work is public in character. By maintaining this attitude of mind they will earn the right to be classed as professional men.

Procrustean Education

The engineering school of today is like the legendary Grecian highwayman, Procrustes, who tied his victims to an iron bed, and, as the case required, either stretched or cut off their legs to adapt them to its length. The college solves only half the vocational problem. It gives vocational counsel and training but neglects vocational analysis and placement.

The engineering schools fit men for a practical life of useful citizenship but do not fit their curricula to the peculiar needs of each man. They deal with groups and not with individuals. Students are allowed to take courses for which they have no natural aptitude. Certain courses are prescribed regardless of the students' ability and he is disbarred from others in which he might show great proficiency.

In the light of recent successes in the scientific employment of men it would seem that similar methods might be adopted by the universities in analyzing their matriculants. It is a notorious fact that many men who prepare for engineering careers drift into other fields later in life. While an engineering education is a good foundation for many other lines of work, a more specific preparation based upon scientific vocational analysis, would lead to an earlier success. Conversely there are many misfits in engineering occupations.

The other factors in which colleges seem remiss are in vocational placement. Like a salesman who forgets a customer after he has sold him a bill of goods, the average school allows its graduates to shift for themselves. Instead of following up its alumni, advising them of positions and trying to help their advancement,

the college devotes all its energies to turning out new batches of men.

These two neglected functions, for the average engineering school, might well be assigned to one man who is an expert on human analysis. By conferring with the freshmen he can advise them what to study and by corresponding with the graduates he can place them where they can apply their knowledge to the best advantage. This is a new field that seems worthy of attention.

Superiority of Electricity for Ice Rinks

Everyone who has poured ether into the palm of the hand will recall that a sensation of cold is immediately produced. This is due to the fact that ether rapidly evaporates at the temperature of the body and, in order to pass from the liquid into the gaseous state, it must absorb quickly a large quantity of heat. This heat is as a consequence drawn from the palm of the hand and the result is that the palm of the hand feels cold.

This principle is made use of in the indirect system of refrigeration described on another page of this issue for the creation of an artificial ice pond for skating. In that instance liquid ammonia is used instead of ether and brine is the surrounding medium instead of the palm of the hand. All that is principally necessary in addition to the ammonia and brine, in order to make a going ice plant, is to install a pump, electrically driven, to cause the cold brine to circulate when refrigeration is desired and at the same time provide some means of compressing the ammonia gas formed in expansion from its liquid and then pump this resulting liquid back again into the receptacle used in the ice-making cycle.

In the operation of the modern ice rink, the condition of the weather has something to do with the energy required to keep the rink in proper working order, but by far the more important factor to know is the number of people utilizing the rink at any given time.

Ice skating in its ultimate analysis is nothing but the rubbing of steel under pressure against an icy surface. This of course results in the creation of friction and friction is nothing but the dissipation of heat. A vast difference, then, is to be expected in the refrigeration required to maintain an ice coating in a skating ring when only one hundred people are utilizing its surface as compared to the requirements under a bristling, rollicking crowd of fifteen hundred. And this proves to be the case in actual operation.

Right at this point, then, is where the delicate control of electrically operated refrigeration plants are making their lasting gain in popularity over any other known source of generation. It is simply surprising to see to what delicate shades of temperature a rink may be regulated under such control.

It is a well-known fact that an ice rink best develops an ideal surface quality when its temperature is at the melting point of ice—namely at 32 degrees F. At this temperature any unevenness in surface rapidly levels itself and at the same time a certain resiliency in the ice is attained that is not found to exist at other temperatures.

For such delicate control the electrical method proves to be without a peer and as a consequence once again the central station is to find in the increasing popularity of the artificial ice rink, another profitable and growing source of revenue.

A Platinum Rule of Conduct

Occasionally some one states an obvious fact so sententiously that people wonder why its truths had not been given greater recognition before. Such a statement was recently made by Mr. George L. Dillman, a well-known consulting engineer in an address before the San Francisco section of the American Society of Civil Engineers. Strangely enough it has to do with ethics rather than engineering, though coming as the result of a rich and varied engineering experience.

The essence of his discourse was that "authority should lie with responsibility." Responsibility should not be imposed without a corresponding authority imposed, authority should not be exercised without a proportionate assumption of responsibility. Observance of this principle brings success into every human relationship, neglect causes failure.

Its truth is well illustrated by its violation. In the home, disputed authority or shirked responsibility causes discord; in business, "butting in" or shirking results in failure; in politics, authority without responsibility brings inefficiency.

Many a man is given a job when he cannot make good because his hands are tied. He has the responsibility but is without the authority to execute it. Conversely, authority without responsibility is equally as bad, as may be exemplified by a public service corporation or a labor union.

Responsibility is negative, downward, centripetal, —authority is positive, upward, centrifugal. Their balance gives harmony, their unbalance discord. Success depends upon their equilibrium, an excess of either causes failure. It is the willingness and ability to assume the burden that measures a man's capacity for success. It is the amount of authority granted him that determines that success.

A man's income is usually measured by the responsibility he carries. In this sense details are not necessarily responsibilities. The successful man of heavy responsibilities delegates the details to assistants who are vested with authority to carry them out. But for every responsibility shifted there must be a compensating shift of authority.

Thus it is seen that Mr. Dillman's principle is only a special instance of the great law of compensation. As a rule of conduct it is so invariable and so precious that it might well be called the platinum rule as compared with the Golden Rule. Let response to responsibility always be met by authorization of authority—never delegate authority without specifying responsibility.

PERSONALS

Chas. S. Pflasterer, of the National Carbon Company, is at San Francisco from Cleveland, Ohio.

G. L. Oman, of the General Electric Company, has returned to Portland from a visit to California.

E. C. Jones, chief gas engineer Pacific Gas & Electric Company, has returned to San Francisco from Chicago.

H. B. Squires of the H. B. Squires Company, has returned to San Francisco from an automobile trip to Los Angeles.

W. H. Trimm, secretary and general manager of the Monarch Telephone Manufacturing Company at Fort Dodge, Iowa, is at San Francisco.

C. G. A. Baker, vice-president and treasurer of the Baker-Joslyn Company, has returned to San Francisco from a short business trip to Los Angeles.

Roy Worth, salesman with Pacific States Electric Company, at Seattle, and **H. C. Chapman,** at Los Angeles, were at San Francisco during the past week.

H. L. Jackman, manager of the Western States Gas & Electric Company of Eureka, Cal., recently returned from an extended business trip throughout the East.

R. D. Holabird, of the Holabird-Reynolds Company, will return to San Francisco from an extended business trip throughout the East about the first of November.

F. Getter battery engineer of the Spokane Inland Empire Railroad, has recently returned from Nogales, where he had command of Company C of the Idaho Infantry.

W. D. Peaslee, electrical engineer, Oregon Agricultural College, read a paper on "Electric vs. Steam Logging," before the Pacific Logging Congress at Portland, this week.

H. L. Gift, formerly connected with the sales force of the Pacific States Electric Company at Seattle, has recently joined the sales force of the Baker-Joslyn Company.

A. M. Irwin, assistant to the treasurer of the Westinghouse Electric & Manufacturing Company, of San Francisco, recently returned from a business trip to Los Angeles.

C. C. Hillis, manager of the Electric Appliance Company, recently returned to San Francisco from the East, where he attended the convention of the Electrical Supply Jobbers at Cleveland.

Thomas Finigan, manager sales department American Brakeshoe & Foundry Company, San Francisco, has been re-elected president of the American Electric Railway Manufacturers' Association.

Thos. Dooling, of the Electric Storage Battery Company of San Francisco, who was with the Signal Corps of California on the border, is expected to be back on the job about the first of November.

Miles F. Steel has succeeded F. H. Poss as Pacific Coast manager of the Benjamin Electric Manufacturing Company. **C. O. Martin** recently arrived at San Francisco to act as salesman in the Western teritory.

F. D. Fagan, sales manager of the lamp department of the San Francisco office of the General Electric Company, has recently been appointed district sales manager for the Pacific Coast of the Edison Lamp Division.

Henry L. Doherty of New York has been elected reigning Jupiter of the Jovian Order; **J. S. Colwell** of Seattle, member of the Congress for the twelfth district, and **T. E. Collins** of San Francisco, for the thirteenth district.

John A. Britton, vice-president and general manager Pacific Gas & Electric Company, who was operated on for appendicitis about the first of this week, is getting along nicely, and expects to be out about the last of next week.

L. G. Cushing, traveling salesman for the Connecticut Electric & Manufacturing Company, is a recent visitor on the Coast. Mr. Cushing is making his semi-annual tour of inspection of the branch offices, and is now at Los Angeles.

F. H. Poss, who has been the Pacific Coast manager of the Benjamin Electric Manufacturing Company during the past ten years has been made sales manager of the company at Chicago. He leaves San Francisco this week to assume his new duties.

L. S. Ruble of the Northwestern Electric Company, has been elected president of the recently organized Electrical Storekeepers' Association of Portland, Ore.; **C. H. Still** of the Pacific Power & Light Company, first vice-president; **S. F. Clark,** of the S. P. & S. Railway Company, second vice-president; **G. O. Hunter** of the Portland Railway, Light & Power Company, treasurer, and **J. G. Weber** General Electric Company, secretary.

W. A. Motter, designer of direct current apparatus for the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has returned to the East after completing the installation of a big motor generator set for the Pacific Electric Company at Los Angeles. The Allis-Chalmers people have recently completed the sale of a 4000 h.p. unit to the Snow Mountain Power Company at Ukiah. This includes generator, waterwheels, etc.

OBITUARY.

Harry H. Gribben, superintendent of the Oakland, Cal., factory of the Standard Underground Cable Company, died suddenly September 26th at his home in Oakland, age 56 years, 8 months and 7 days. Mr. Gribben was a native of Pittsburgh, Pa., and lived there until 1899, when he moved to California to take charge of the factory which the Standard Company had then just completed. Previous to this he was general foreman in the company's Pittsburgh factory. He had been in the employ of the Standard company for over 30 years and was one of its most faithful, loyal and competent superintendents, and a man who by his personal qualities endeared himself not only to his business associates but to every one with whom he came in contact. At a recent meeting of directors suitable resolutions were passed expressing the Standard Company's sense of loss in the passing away of one of its oldest employes in point of service.

MEETING NOTICES.

San Francisco Electrical Development and Jovian League.

President-elect Newbert started his term of office with an interesting meeting on October 18th. Believing that the success of the League is largely dependent upon strong committee work he announced the following personnel for his several committees:

Finance—W. S. Berry, R. F. Behan, T. W. Simpson.

Public Affairs—A. H. Elliott, P. J. Ost, C. F. Butte.

Visiting—W. R. Dunbar, A. E. Drendell, R. G. Guyett.

Reception—H. P. Pitts, E. O. Shreve, D. E. Harris, P. Decker, E. E. Browne.

Publicity—F. M. Cutting, A. H. Halloran, T. E. Collins.

Entertainment—N. J. Prendergast, H. E. Fisher, M. S. Crrick.

Membership—W. F. Neelands, F. E. Boyd, G. L. Galbraith.

Mr. Walter K. Brown, district manager of the Crocker-Wheeler Company, as chairman of the day, introduced Dr. J. H. Graves, who read an instructive address on the negative side of Social Insurance. He explained the purpose of contemplated legislation to provide compulsory insurance for salaried workers by a plan which includes the deduction of a small per cent of their wages, by a tax on the employer and a contribution from the state. After briefly stating its origin in Germany he put five pertinent questions. Is such a law needed? Do the beneficiaries want it? Could it be amended so as to be objectionable to all? What effect will it have on the medical service rendered the people? What effect will it have on

those who do not come within its provisions? Discussing these at length he argued that such a law was not needed, not wanted, and was in many ways objectionable and undesirable. He advised that the matter not be acted upon hastily but that it be given future study and thought. C. F. Butte supplemented the speaker's remarks by stating that after careful study a committee of the building trades employers had found the proposal unwise. At the conclusion of the meeting the speaker was extended a vote of thanks.

Oregon Society Engineers.

At the October 20th meeting the speaker of the evening was Mr. Frank F. Sinks, Mem. Am. Soc. C. E., and engineer and general manager of the Pacific Coast Steel Company. The subject was "Steel Making on the Pacific Coast," illustrated by moving pictures and stereopticon views which showed the actual operations in the manufacture of steel at the Seattle plant of the Pacific Coast Steel Company. He stated that they used electric power wherever they could and that they now had a 1200 h.p. and an 800 h.p. motor operating rolls. The society endorsed the road resolution passed by the county judges and commissioners association of Oregon in regard to road legislation. The resolution in substance is as follows: "A formal request to the Bureau of Public Roads in the Department of Agriculture, Washington, D. C., for a code to cover all the phases of road legislation in the state of Oregon."

Los Angeles Jovian Electric League.

October 18th was observed by the League as "Edison Day" and a large number of Jovians and their friends assembled at the luncheon to pay tribute to the great master of the electrical industry. C. E. Spaulding, local sales manager of the Edison Lamp Works and General Electric Company, was master of ceremonies and presented a well-balanced and interesting program. A. E. Morphy, the newly-elected President, wielded the gavel with considerable energy and kept things moving with alacrity and dispatch. He is particularly proficient in the art of collecting fines from the members, which augurs well for a successful season from a financial standpoint at least. Geo. P. Barton, former general patent attorney for the Western Electric Company at Chicago, and prominent patent attorney, was speaker of the day. His subject was "Some Early Electric Patent Decisions." Mr. Barton, in his legal capacity, was involved in some of the infringement and interference suits in the days of the old Brush and Thomas Houston Electric Company, and he told some interesting facts concerning the suits affecting Mr. Edison's patents. He stated that his lamp invention was involved in 22 different cases, and although patents were issued in 1880, it was not until 1891 that a favorable decision was affirmed on appeal. Mr. Barton was followed by James Lighthipe of the Southern California Edison Company, who was associated with Edison and with him at the time the electric lamp was invented. In a brief talk, he told of some of his experiences.

NEWS OF CALIFORNIA WATER COMMISSION.

Wm. M. Hunt, Jr., of Victorville, on behalf of the proposed Mojave Irrigation District, now in process of formation, has applied for permission to appropriate 300 cubic feet per second of the waters of Deep Creek and west fork of the Mojave River, tributary to Mojave River in San Bernardino county. The plan proposes a monolithic gravity concrete dam, impounding 100,000 acre feet of water and main canals thirty miles long, for the irrigation of 50,000 acres.

E. E. Pollock of Redding has applied for permission to appropriate for agricultural purposes, 15 cubic feet per second of the waters of the east fork of Stillwater Creek, tributary to the Sacramento River. It is proposed to store water by means of three dams built of gravel and clay with concrete core. The main ditch is given as a mile long. The estimated cost is $2000 and the number of acres to be watered is 400.

J. Overholtzer of Glenn, Glenn County, has applied for permission to appropriate 60 cubic feet per second of the waters of the Sacramento River in Glenn County. The proposition is to divert the water by means of electrically driven pumps discharging into a main canal five miles in length. The estimated cost of the works is given as $15,000 and the number of acres to be watered as 7000, situated in Glenn and Colusa counties.

The Landis Bros. of San Francisco, have applied for permission to appropriate 100,000 acre feet per annum of the waters of Dry Creek, tributary to Mokelumne River, in San Joaquin and Sacramento counties. The diversion proposes a concrete multiple arch dam 60 ft. high, 1400 ft. on top and 1200 ft. on bottom, which shall serve the purpose of both a storage and diversion dam. This it is proposed to locate on the Arroyo Seco Ranch. The estimated cost of the project is given as $1,000,000, and it is contemplated to water 100,000 acres. The commission has allowed the applicants until May 1, 1917, to file complete data and maps.

W. F. Fowler of Willows has applied for permission to appropriate 250 cubic feet per second of the waters of the Sacramento River for rice culture on 14,000 acres. The water will be raised by electrically-driven pumps to the main canal which is given as 10 miles in length. The proposed works will cost, at an estimate, $180,000.

The Peoples Water Company of Oakland has applied for permission to appropriate 5500 million gallons of the waters of San Pablo Creek in Contra Costa county to supply Oakland, Berkeley, Alameda, Richmond, Emeryville, Piedmont, San Leandro, Albany and contiguous incorporated territory. The proposed works are given as follows: Dam, 160 ft. high, 1250 ft. on top, hydraulic earth fill with concrete core-wall, capable of impounding 40,000 acre feet; main ditch and pipe line, 15,000 ft. long. The application states that applicant is ready to begin construction January 1, 1917, and complete same January 1, 1920. The estimated future requirements of the cities are given as follows: In 1920, 7230 million gals.; in 1924, 9130 million gals.; in 1928, 11,610 million gals.; in 1930, 12,900 million gallons.

J. G. Van Zandt of Forest Home, San Bernardino county, has applied to appropriate waters of the north tributaries of Mill Creek, tributary to Santa Ana River, to the amount of 25 cubic feet per second for the purpose of generating power for manufacturing purposes. The enterprise is known as the San Gorgonio power project. There is a proposed pipe line five miles in length, and a fall of 2230 ft., to be utilized for the generation of 6333 theoretical horsepower, at an estimated cost of $500,000. The water is to be returned to the stream after use for power. Work on the project began in 1913 and the application sets forth that it will be completed in 1919. The application further says: This application is made to initiate an adjudication by the water commission, of the rights of J. G. Van Zandt, who has purchased the rights previously held by C. G. Baldwin (under previous law conditions which have been fulfilled), but whose federal permit was revoked October 16, 1914, on account of non-payment of fee, said Van Zandt holding permit from federal offices for use of water, claims this water under previous filing and construction work, as required by previous law. Should the water commission find this sufficient evidence of right of use, this application may be dropped.

Frank M. Ish of Oakland has applied for permission to appropriate all the un-appropriated water, with a minimum of 100 second feet, of the waters of the South Fork of the Merced River in Mariposa county for the generation of electric power. The application sets forth a proposed flume and pipe line 8 miles long, to be known as the Tioga Flume and Pipe Line, and states that the fall to be utilized is 1600 ft.

for the generation of 10,000 theoretical horsepower. The water is to be returned to the stream after use for power. The estimated cost is given as $1,500,000. The power is to be for general distribution. The application states that work will commence June 1, 1917, and be completed June 1, 1919.

NEWS OF IDAHO PUBLIC SERVICE COMMISSION.

A certificate of public convenience and necessity has been issued to the Idaho Power Company for serving Filer, Twin Falls County, Idaho.

NEWS OF WASHINGTON PUBLIC SERVICE COMMISSION.

On October 30 and November 1 the commission will hold hearings in Olympia to go over with the gas, water and electric company representatives all questions relating to such concerns before printing the new set of rules and regulations. The copies of the printed rules and regulations have become exhausted and at those sessions it will be determined whether or not any changes should be made.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

The Halfmoon Bay Light & Power Company has applied for permission to sell its properties to the Great Western Power Company.

The Pacific Gas & Electric Company has asked permission to use the proceeds now on hand from the sale of its general and refunding mortgage gold bonds and first preferred stock to reimburse its treasury $1,068,803.86 for expenditures for improvement and betterment. On January 3 of this year the commission authorized the company to issue and sell first preferred stock in the amount of $2,500,000 at 90, and to issue and sell bonds to the amount of $2,000,000 at 85. The company says it contemplates an expenditure of $3,150,000 in the future.

PUBLIC SAFETY HEARINGS.

The Industrial Accident Commission has arranged for four Public Safety Hearings in San Francisco, as follows: Window Cleaning Safety Orders, Monday, October 30th; Trench Construction Safety Orders, Tuesday, October 31st; Air Pressure Tank Safety Orders, Wednesday, November 1st; Electrical Utilization Safety Orders, Thursday, November 2nd. These public hearings will be held in Room 407, Underwood building, 525 Market street, San Francisco, commencing at 10 a. m. for each hearing. Similar public hearings will be held in Los Angeles, as follows: Window Cleaning Safety Orders, Monday, November 13th; Trench Construction Safety Orders, Tuesday, November 14th; Air Pressure Tank Safety Orders, Wednesday, November 15th; Electrical Utilization Safety Orders, Thursday, November 16th. These public hearings will be held in Room 405, Union League building, Los Angeles, commencing at 10 a. m. for each hearing.

The tentative Trench Construction Safety Orders give standards for sheeting, shoring and bracing trenches and define where they will be required. There were 18 fatal trench construction industrial injuries in 1915, 9 permanent injuries and 546 temporary injuries. The total compensation paid in the 27 fatal and permanent injuries were $6,854.86. The medical payments amounted to $1,231.

The tentative Electrical Utilization Safety Orders cover safety standards for equipment, storage batteries, transformers, lightning arresters, conductors, switches, fuses, switchboards, motors and motor-driven machinery, arc welding, lighting fixtures and signs, portable devices, cables and connectors, etc. The orders were based on the electrical utilization section of the proposed National Electrical Safety Code prepared by the U. S. Bureau of Standards. There were 25 fatal electrical industrial injuries in 1915, 9 permanent injuries and 384 temporary injuries. Total compensation payments made in the 34 fatal and permanent injuries amounted to $15,175.91, and medical payments in these cases amounted to $16,629.92.

NEW CATALOGUES.

Catalogue No. 1, from Kellogg Switchboard & Supply Company, 86 Third street, San Francisco, presents valuable data on line construction material, "everything to connect the 'phone to the 'board."

"Handy Electric Wiring Devices" are illustrated and described in Catalogue No. 24 from Pass & Seymour, Inc., of Solway, N. Y. The most noticeable feature is a comprehensive charting of interchangeable parts. This shows the several devices that can be assembled from the different parts and is conveniently arranged for rapid reference.

As part of a comprehensive campaign to interest farmers in electrical devices, the Western Electric Company, is widely advertising "The Farmer's Electrical Handbook," a text written in an admirably clear and able manner. Dealers are advised as to those who receive the book and a folder entitled "New Customers for" is being sent to contractors and central stations.

"Cashing in On A. E. W." is the subject of an attractive folder sent by the Western Electric Company to electrical dealers. It announces various sales helps which are available to promote the use of sewing machine motors, washing machines, cleaners, irons, ranges and vibrators. It also gives definite plans and suggestions for cashing in on America's Electrical Week.

PUBLICATIONS RECEIVED.

Scientific Paper No. 292 from U. S. Bureau of Standards, "International System of Electric and Magnetic Units," discusses proposals for changes.

A new publication of the Bureau of Standards (Scientific Paper No. 290) entitled "A Variable Self and Mutual Inductor," outlines the development of a new form of instrument for varying the self inductance of a circuit, or the mutual inductances between two circuits.

Scientific Paper No. 291, from U. S. Bureau of Standards, illustrates and describes "A System of Remote Control for an Electric Testing Laboratory."

The Associated Manufacturers of Electrical Supplies, 62 Cedar street, New York, has issued a folder under the title, "What It Has Accomplished," noted as general secretary's Bulletin No. 4. The folder explains the objects of the Association, the results, activities, affiliations, various sections, etc. The officers are: President, R. K. Sheppard; vice-president, H. B. Crouse; treasurer, J. W. Perry; general secretary, Charles E. Dustin; board of governors, A. W. Berresford, Cutler-Hammer Mfg. Co., Milwaukee, Wis.; Charles Blizard, Electric Storage Battery Co., Philadelphia, Pa.; Leroy Clark, Safety Insulated Wire & Cable Co., New York; H. B. Crouse, Crouse-Hinds Co., Syracuse, N. Y.; L. W. Downes, D. & W. Fuse Co., Providence, R. I.; D. C. Durland, Sprague Electric Works, General Electric Co., New York; J. J. Gibson, Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.; E. B. Hatch, The Johns-Pratt Co., Hartford, Conn.; H. R. Holmes, R. Thomas & Sons Co., East Liverpool, Ohio; J. F. Kerlin, National Carbon Co., Cleveland, Ohio; J. W. Perry, H. W. Johns-Manville Co., New York; Warren Ripple, George Cutter Co., South Bend, Ind.; W. C. Robinson, National Metal Molding Co., Pittsburgh, Pa.; B. E. Salisbury, Pass & Seymour, Inc., Solvay, New York; R. K. Sheppard, Simplex Wire & Cable Co., Boston Mass.; counsel, Thomas M. Deveboise, 62 Cedar street, New York.

NEWS NOTES

INCORPORATIONS.

SALINAS, CAL.—The Pacific Telephone & Telegraph Company was the only bidder for a telephone and telegraph franchise and its bid was accepted.

ELLISPORT, WASH.—The Vashon United Telephone Company has been incorporated here for $50,000 by C. H. Newcom and C. A. Collins, Ellisport, and C. F. Van Olinda, Portage.

STANWOOD, WASH.—The Peoples' Telephone Company has been incorporated here with a capitalization of $10,000 by Peter Henning, John Ellingsen, S. J. Barnum, C. Jorgenson and Edwin Egge.

SAN FRANCISCO, CAL.—The Victor Electric Corporation of California has been incorporated with a capital stock of $25,000, by H. J. Ingersoll, W. D. Eddy, W. G. Hargis, Jr., G. L. Bush and L. C. Shingle.

FINANCIAL.

CLE ELUM, WASH.—Bids will be received up to Monday, November 6, at 8 p. m. for the purchase of $5000 in bonds, proceeds to be used in part for the construction of municipally owned electric light and power distributing system for the town.

SALEM, ORE.—The Portland Railway, Light & Power Company's deficit on its railway, light, power and gas operations totaled $130,260.42 in the year ending June 30, according to its annual report on railway operations, filed with the public service commission. The loss was $153,411.91 greater than during the previous year. Revenues from railway operation totaled $3,254,076.77, a decrease of $209,097.32 over the previous year. Railway operation expenses totaled $2,051,798.92, a decrease of $21,148.90. The net revenues from railway operations totaled $1,202,277.85, a decrease of $187,948.42 over the previous year. Auxiliary operating revenues, derived from light, power and gas, were $1,976,216.77, a decrease of $44,817.22; operating expenses, $780,115.59, a decrease of $18,830.41, and net operating revenues, $1,865,420.86, a decrease of $120,407.48. The operating income from all sources of revenue totaled $1,865,420.86, a decrease of $120,407.48.

ILLUMINATION.

EPHRATA, WASH.—The council has decided to place electric street lights in the business district.

JUNEAU, ALASKA.—Geo. Irving and Frank L. Clark have asked for a franchise to erect a gas plant.

CAMAS, WASH.—Oak Park district residents have taken steps toward securing a street lighting system.

WINTON, CAL.—The San Joaquin Light & Power Company is seeking to establish a lighting district in and around Winton.

CEDARDALE, WASH. A petition is being circulated for an electric lighting system. Mrs. Raymond Vashaw is promoting the matter.

GILMORE, IDAHO.—Bids are being called by the Pittsburg & Idaho Mining Company at this place for installation of a new power plant to furnish electric energy for the mine.

LOS ANGELES, CAL.—An ordinance has been adopted by the city council ordering the installation and furnishing of electric current for the lighting of Sixth street between Palos Verde street and Pacific avenue.

SEATTLE, WASH.—The Bremerton city council has given the franchise for the construction of a gas plant there to E. L. Blaine of the Graff Construction Company, Seattle, who will invest over $150,000 in a new plant at once.

PORTLAND, ORE.—The Board of County Commissioners will receive bids at Room 200, Court House, Portland, until October 27 for copper conductors, lamp post brackets, transformers and fixtures for lighting the Interstate bridge.

MIAMI, ARIZ.—J. W. Young, manager of the Midland Land Company, has not decided yet what arrangements will be made for electric lights for the new townsite, but states that if necessary the company will install its own plant.

BEAUMONT, CAL.—Work has been started on the pipe line from this city to Banning, which is being installed by the Riverside County Gas & Power Company, recently organized to convey gas from its plant in this city to the Banning system.

PE ELL, WASH.—The light situation in Pe Ell was canvassed the first of the week by several officials of the North Coast Power Company, with a view to establishing a light plant in the town. Their decision will be made known later. The estimated cost of the new plant is $17,000.

OCEANSIDE, CAL.—Sealed bids will be received up to October 25th for lighting the streets of Oceanside, for a period of five years beginnig December 1, 1916. The person or corporation to whom the contract is awarded shall at his own expense furnish, place, install and maintain wires, lamps, poles and all other equipment required for said lighting, in accordance with plans on file with the city clerk.

LOS ANGELES, CAL.—The board of public works will receive up to October 30th, sealed bids for the installation of the necessary appliances and for furnishing the necessary electric current and maintaining said appliances for a period of one year, for lighting Adams street, between Figueroa street and Hoover street. A certified check for 10 per cent to accompany each bid. The right is reserved to reject all bids.

LOS ANGELES, CAL.—Plans to place this city ahead of any other in the matter of ornamental lighting, assumed tangible form at a recent meeting of business men. A special committee was named to further a movement for the early action and to the committee was added another advisory committee that will keep in touch with the plans for the initial installation of lights and foster the adoption of the system on other streets of the city. Initial installation will be made upon plans to be designed by W. D'A. Ryan.

TRANSMISSION.

PORTOLA, CAL.—The owners of the Walker Copper mine, 25 miles from Portola, are preparing for the construction of an extensive power plant.

KINGMAN, ARIZ.—The California & Nevada Telephone Company has a force at work digging trenches for underground conduits which will eliminate the placing of the telephone wires on poles.

DEER PARK, WASH.—The Deer Park Lumber Company has petitioned the county commissioners for a franchise to construct an electric light and power line along the road entering Deer Park, from the lumber company's plant.

GILMORE, IDAHO.—Bids are being received by the Pittsburg Idaho Mining Company at Gilmore, Idaho, for the installation of a new power plant to furnish electrical energy for the mine. The machinery will include hoist, compressor, pumps, machinery for ventilation, dynamo and electric lighting.

SAN DIEGO, CAL.—Managing Director Clayton of the San Diego Electric Railroad Company, has announced that a decision has been reached to construct a new substation which will increase the power needed to give more rapid service between San Diego and Chula Vista. Work will be started at an early date.

MARSHFIELD, ORE.—Manager A. L. Martin of the Oregon Power Company, has been authorized to install a new

transmission 11,000 volt line between the C. A. Smith mill and the company's substation at Porter. The installation will necessitate a number of important transformers. The work will cost about $18,000.

KINGMAN, ARIZ.—Notice has been given that it is the intention of the board of supervisors to grant a franchise to the Oatman Hydroelectric Power Company, to acquire and operate a public utility in Mohave county, for generating electric power to be transmitted and consumed in Oatman mining district and neighboring sections of the county.

LOS ANGELES, CAL.—The city council has resolved that it is necessary for municipal purposes that a permanent easement and right of way over certain property be acquired by condemnation, for the purpose of constructing, maintaining and operating electric power transmission lines, together with operation of said lines, in connection with proposed electric system, together with telephone lines, extending from a point in Inyo County to a point in Los Angeles County.

LOS ANGELES, CAL.—A proposition has been made that the city purchase for $12,561,500 the distributing systems of the Southern California Edison Company, the Pacific Light & Power Company and the Los Angeles Gas & Electric Company in the city of Los Angeles. This carries with it a 10-year contract for the city to buy from the corporations at 1 cent per kw.-hr. all the power required in excess of its own hydroelectric production. By making an initial payment of $3,561,500 the balance with six per cent interest thereon can be taken care of by revenues during the next ten years. The property to be purchased includes the steam plant of the Los Angeles Gas & Electric Corporation. Chief Engineer E. F. Scattergood opposes paying more than $10,000,000 for the properties.

TELEPHONE AND TELEGRAPH.

BARSTOW, CAL.—Arrangements are being made to connect the Interstate Telephone Company's line with Hinkley, ten miles north of Barstow.

LOS ANGELES, CAL.—The San Gabriel River Water Committee has contributed $200 to the forest service for the construction of a telephone line from Fellows Camp to ranger station, three miles away.

BRIDGEPORT, WASH.—Mr. Nichols of Marcus, Wash., who recently purchased the Bridgeport telephone exchange from F. G. Green has taken charge of the system personally and is anticipating improvements.

WILLOWS, CAL.—Attorney Frank Freeman, as a stockholder of the Glenn County Telephone Company, which with the Colusa County and Tehama County Telephone Companies, was sold to a subsidiary of the Pacific States Company, has commenced an action against the directors of the Glenn Telephone Company to compel them to return to the company about $42,000 and bonds valued at $10,000.

PORTLAND, ORE.—The Home Telephone & Telegraph Company is to be reorganized. Notice has been given the bondholders of the company that the company would be unable to meet its obligation to pay the semi-annual interest on its bond issue, due October 15th. This is to be the first step in the reorganization of the company's securities, in order to place the company on a more substantial basis. In the meantime, the company will maintain its present service and meet all current obligations.

TRANSPORTATION.

WALLA WALLA, WASH.—Granting of a franchise to the Walla Wala Railway Company for the construction and maintenance of an electric line on South Ninth street from Orchard to Main street will be submitted to the voters at the regular election this fall.

SALT LAKE, UTAH.—Joel Richards, traffic manager of the Saltair Beach Company, states that the Saltair Railroad, will be electrified and an extension to Garfield completed this winter at a cost of more than $300,000. A bond issue in this amount will be floated at once.

SPOKANE, WASH.—Announcement has been made that plans are being worked out by the Great Northern Railroad Company for the electrification of more than 300 miles of main line between Spokane and Seattle, and other mountain divisions in the West. It is understood the actual preliminary work on the project will be started by next summer.

DIXON, CAL.—J. J. Smith, prominent farmer and stock raiser of Solano county, and recently elected director of the Sacramento Valley Electric Railroad or the "Farmer's Line," states the company has no intention of going out of business and on the contrary is planning the building of the second unit from Dixon to Woodland. The board of directors plans to push to completion the unit of the proposed road as soon as the outstanding notes and interest thereon shall be collected.

IRRIGATION.

FILLMORE, CAL.—At a recent meeting of the city trustees a letter was received from the Fillmore Irrigation Company stating that work would soon be underway on a new pipe line on A street.

OAKDALE, CAL.—The contract for concreting the main canal of the Oakdale irrigation district at Two-mile Bar has been let to Tieslau Bros. of Oakland, on their bid of $5.10 for concreting and $1.50 for excavation.

DINUBA, CAL.—C. F. Balaam and C. A. Beinhorn of Exeter, and Charles H. Segerstrom, who have bought orange groves at Naranjo, as well as 40 acres lying between these groves, will install a modern irrigation system.

PHOENIX, ARIZ.—The ranchers around Higley and on the desert east of Mesa are taking active steps toward securing electric power to be used in raising water for irrigation. The plan is to organize a district to comprise 50,000 acres. It is estimated that $5 per acre will cover the needed amount for running main lines, placing of transformers, etc.

WILLOWS, CAL.—The supervisors have fixed the boundaries of the Jacinto irrigation district on practically the lines as approved by the state engineer. A number of purchasers of land who hold contracts under the Superior California Farm Lands Company and who asked to be excluded, were denied that privilege owing to the fact that their contracts provide for an irrigation system.

NORTH YAKIMA, WASH.—The fourth annual convention of the Washington Irrigation Institute will be held in this city on November 13-14. The leading speakers will be: John A. Whidtsoe, president of Utah University; I. D. O'Donnell, of Billins, Mont., United States Supervisor of Irrigation; E. A. Golderweiser, statistician of the United States Department of Agriculture, and Governor Ernest Lister.

MODESTA, CAL.—Bids for the purchase of the $465,000 bonds voted by the Waterford irrigation district for rights to the main canal of the Modesto district, and for the construction of a distributing system of canals, have been rejected by the Waterford district directors. The board will re-advertise for bids, to be opened November 10th, in hope of getting higher bids. All offers were too low, ranging from 93¾ to 96½.

SAN BERNARDINO, CAL.—The initial step in the purchase for $2,500,000 of the properties of the Arrowhead Reservoir & Power Company was taken when an option was signed between Victor C. Smith, vice-president and general manager of the company, and Charles F. Guthridge of Los Angeles, who, with other big owners in the region, want to organize an irrigation district project. Under this scheme lands on both sides of the Mojave River from Hesperia to Victorville would be included.

Journal of Electricity, Power and Gas

ELECTRICAL PRICE INDEX

Number 30

Tools.	Cost.	List.	Sell.
16 ft. x 0 in. Extension	.....	7.20	7.20
20 ft x 0 in, Extension	.....	9.00	9.00
24 ft. x 0 in. Extension	.....	10.80	10.80
28 ft. x 0 in. Extension	.....	14.00	14.00
¼x12 in. Star Drills, per doz	.....	8.50	8.50
⅜x12 in. Star Drills, per doz	.....	8.50	8.50
½x12 in. Star Drills, per doz	.....	10.00	10.00
⅝x12in. Star Drills, per doz	.....	12.00	12.00
¾x12 in. Star Drills, per doz	.....	14.00	14.00
⅞x12 in. Star Drills, per doz	.....	16.00	16.00
1 x12 in. Star Drills, per doz	.....	18.00	18.00
1⅛x12 in. Star Drills, per doz	.....	24.00	24.00
¼ in. Star Drill Points, per doz	.....	8.50	8.50
9/32 in. Star Drill Points, per doz.	.....	8.50	8.50
5/16 in. Star Drill Points, per doz.	.....	8.50	8.50
⅜ in. Star Drill Points, per doz	.....	8.50	8.50
¾ in. x 6 in. Octagon Drill Holder for points	.....	24.00	24.00
for point	.....	24.00	24.00
Extension Boring Machines, each	.....	25.00	25.00
Zinc Oilers, per doz	.....	4.00	4.00
Transformers—Bell.			
16 Watts, Junior	.....	3.00	3.00
25 Watts, "A"	.....	4.00	4.00
25 Watts, "B"	.....	5.00	5.00
60 Watts, "A" heavy output	.....	6.00	6.00
60 Watts, "B" heavy output	.....	7.00	7.00
8 Volts, 25 W	.....	5.00	5.00
6-12-18 Volt, 60 W	.....	7.50	7.50
WIRE			
Rubber Covered.			
Solid Single Braid, per 1000 ft.			
0	.....	$479.00	$335.30
1	.....	347.00	242.90
2	.....	267.00	186.90
3	.....	216.00	151.20
4	63.36	176.00	123.20
5	.....	147.00	102.90
6	.....	122.10	85.47
8	26.85	77.10	53.97
10	20.65	54.80	38.38
12	10.80	39.50	27.65
14	10.55	29.40	20.58
Solid Double Braid, per 1000 ft.			
8.35 Amps	32.75	85.10	59.57
10.25 Amps	.....	61.80	43.26
12.20	14.45	45.50	31.85
14.15	8.60	34.40	24.08
Lead Encased Wires.			
Always get quotations from jobber.			

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Journal of Electricity, Power and Gas

ELECTRICAL PRICE INDEX

Number 29

Shades.	List.	Sell.
Flat Opal, 6 and 8 in	.25	.25
Flat Opal, 10 in	.35	.35
Flat Opal, 12 in	.75	.75
Flat Opal, 14 in	.85	.85
Flat Opal, 16 in	1.00	1.00
Half Shades, Billiard Type	1.25	1.25
Parabola Reflectors (O. B.)	.75	.75
Parabola Reflectors (Green)	.60	.60
Flat Tin Shade, 8 in	.35	.35
Cone Tin Shade, 8 in	.45	.45
Cone Tin Shade, 10 in	.50	.50
Cardboard, Plain Edge, 8 in	.30	.30
Cardboard, 10 in	.40	.40
Cardboard, Brass Edge, 8 in	.35	.35
Cardboard, Brass Edge, 10 in	.45	.45

Tape.	Cost.	List.	Sell.
Friction, per lb	.....	.....	.50
Rubber, per lb	.....	.....	1.00
White, per lb	.....	.....	.75
Linen, per yard	.....	.....	.01
Asbestos, Ribbons	.....	.....	1.80
Tacks.			
Carpet Tacks, .05 per box	.....	.10	.10
Tools.			
No. 2 Armstrong Stock, complete, each	.....	12.00	12.00
No. 20 Beaver Stocks, 1 in. to 2 in.	.....	25.00	25.00
No. 41 Beaver Stocks, 2½ in. to 3½ in.	.....	110.00	110.00
No. 1 Toledo Stocks	.....	15.00	15.00
No. 2 Toledo Stocks	.....	25.00	25.00
Vises, large	.....	8.00	8.00
Vises, large	.....	20.00	20.00
½-in. Hickeys	.....	1.75	1.75
¾-in Hickeys	.....	2.25	2.25
3/16 in. Pipe Reamers	.....	1.00	1.00
7/16 in. Pipe Reamers	.....	1.25	1.25
1 3/16 in. Pipe Reamers	.....	3.50	3.50
1 in. to 6 in. Chain Tongs	.....	9.00	9.00
⅛-in. to 1 in, Eck Pipe Cutters	.....	3.00	3.00
½-in. to 2 in. Eck Pipe Cutters	.....	5.00	5.00
4 ft. x 0 in. Ladders—Uddell	.....	2.00	2.00
6 ft. x 0 in. Ladders—Uddell	.....	3.00	3.00
8 ft. x 0 in. Ladders—Uddell	.....	4.00	4.40
10 ft. x 0 in. Ladders—Uddell	.....	5.00	5.00
12 ft. x 0 in. Ladders—Uddell	.....	6.00	6.00
14 in. x 0 in. Ladders—Uddell	.....	7.00	7.00
16 ft. x 0 in. Ladders—Uddell	.....	8.00	8.00
12 ft. x 0 in. Extension	.....	5.40	5.40

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ALPHABETICAL INDEX TO ADVERTISERS

The letter and number before each name are used in the classified page following

A-1 **American Ever-Ready Works of National Carbon Co**
Los Angeles; 755 Folsom St., San Francisco; Seattle.

B-1 **Baker-Joslyn Company** 5
71 New Montgomery St., San Francisco; 911 Western Ave., Seattle; 353 E. Second St., Los Angeles.

I-1 **Benjamin Electric Manufacturing Co** .....
590 Howard St., San Francisco.

C-1 **Century Electric Co** 3
906 So. Hope St., Los Angeles; 56 Natoma St., San Francisco; 65 Front St., Portland, Ore.

C-3 **Crocker-Wheeler Co** 3
87 New Montgomery St., San Francisco; 228 Central Avenue, Los Angeles.

C-4 **Cutler-Hammer Manufacturing Co** 4
579 Howard St., San Francisco; Morgan Bldg., Portland, Ore.; San Fernando Bldg., Los Angeles.

D-4 **Davis Slate & Manufacturing Co** .....
Chicago, Ill.

D-2 **Dearborn Chemical Company** 13
355 East Second St., Los Angeles; 301 Front St., San Francisco.

E-1 **Edison Lamp Works of General Electric Co** .....
Rialto Bldg., San Francisco; 724 So. Spring St., Los Angeles.

E-2 **Edison Storage Battery Co** 13
206-8-10 First St., (near Howard), San Francisco.

E-3 **Electric Agencies Co** .....
279-283 Minna St., San Francisco; 419-421 E. Third St., Los Angeles.

E-4 **Electric Storage Battery Co** 3
743 Rialto Bldg., San Francisco.

E-5 **Electric, Railway & Manufacturing Supply Co** 13
34 Second St., San Francisco.

E-6 **Electric Novelty Works** .....
533 Mission St., San Francisco.

E-7 **Economy Fuse & Mfg. Co** .....
Kinzie and Orleans Sts., Chicago.

F-3 **Federal Sign System (Electric)** 11
618 Mission St., San Francisco.

G-1 **General Electric Co** 12
724 So. Spring St., Los Angeles; Worcester Bldg., Portland; Rialto Bldg., San Francisco; Colman Bldg., Seattle; Paulsen Bldg., Spokane.

H-1 **Habirshaw Electric Cable Co., Inc** .....
(See Western Electric Company.)

H-2 **Hemingray Glass Co** 13
236-240 So. Los Angeles St., Los Angeles; 345 Oak St., Portland; 807 Mission St., San Francisco.

H-3 **Haller-Cunningham Electric Co** 13
428 Market St., San Francisco.

H-7 **Hurley Machine Co** 2
New York and Chicago. (See Pacific States Electric Co.)

I-2 **Illinois Electric Co** .....
261-263 So. Los Angeles St., Los Angeles.

I-3 **Interstate Electric Novelty Co** .....
111 New Montgomery St., San Francisco.

L-1 **Leahy Manufacturing Co** 10
Eighth and Alameda St., Los Angeles.

L-2 **Locke Insulator Manufacturing Co** 14
(See Pierson, Roeding & Co.)

M-2 **McGlauflin Manufacturing Co** 10
San Rafael, Cal.

M-3 **Moore & Co., Charles C** 3
Van Nuys Bldg., Los Angeles; Spalding Bldg., Portland; Kearns Bldg., Salt Lake City; Sheldon Bldg., San Francisco; Mutual Life Bldg., Seattle; Santa Rita Hotel Bldg., Tucson.

M-4 **Morse Chain Company** .....
Monadnock Bldg., San Francisco.

N-1 **Nason & Co., R. N** .....
151 Potrero Ave., San Francisco.

N-2 **National Conduit & Cable Co., The** .....
Trust and Savings Bldg., Los Angeles; Rialto Bldg., San Francisco.

N-3 **National Lamp Works of G. E. Co** .....
(All Jobbers.)

N-4 **New York Insulated Wire Co** .....
629 Howard St., San Francisco.

N-6 **National Carbon Co** .....
Cleveland, Ohio.

O-1 **Okonite Co. (The)** 14
(All Jobbers.)

P-2 **Pacific States Electric Co** 2
236-240 So. Los Angeles St., Los Angeles; 61-67 Fifth St. No., Portland; 200-210 Twelfth St., Oakland; 575 Mission St., San Francisco; 307 First Ave. So., Seattle.

P-4 **Pelton Water Wheel Co** 13
2219 Harrison St., San Francisco.

P-5 **Pierson, Roeding & Co** 14
Pacific Electric Bldg., Los Angeles; Rialto Bldg., San Francisco; Colman Bldg., Seattle.

P-7 **Pittsburgh Piping & Equipment Co** 14
Monadnock Bldg., San Francisco.

S-1 **Schaw-Batcher Company, Pipe Works, The** .....
211 J St., Sacramento; 356 Market St., San Francisco.

S-4 **Southern Pacific Co** 10
Flood Bldg., San Francisco.

S-5 **Sprague Electric Works** 3
Rialto Bldg., San Francisco; Colman Bldg., Seattle; Corporation Bldg., Los Angeles; Electric Bldg., Portland; Paulsen Bldg., Spokane.

S-6 **Standard Underground Cable Co** .....
First National Bank Bldg., San Francisco; Hibernian Bldg., Los Angeles; Central Bldg., Seattle, Wash.; 815 Newhouse Bldg., Salt Lake City, Utah.

T-1 **Thomas & Co., R** .....
Pacific States Electric Co. and Western Electric Co., Pacific Coast Representatives.

T-2 **Tubular Woven Fabric Company** 5
Pawtucket, R. I.

U-1 **United Sheet Metal Works** .....
575 Howard St., San Francisco.

W-1 **Wagner Electric Manufacturing Company** .....
St. Louis, Mo.

W-2 **Western Electric Co** 10
Eighth and Santee Sts., Los Angeles; 1900 Telegraph Ave., Oakland, Cal.; 680 Folsom St., San Francisco; 907 First Ave., Seattle; 45 North Fifth St., Portland, Ore.

W-3 **Ward-Leonard Electric Co** 14
Mt. Vernon, New York.

W-4 **Westinghouse Electric & Manufacturing Co** 6
50-52 East Broadway, Butte; Van Nuys Bldg., Los Angeles; Couch Bldg., Portland; 212 So. W. Temple, Salt Lake City; 165 Second St., San Francisco; Second and Cherry Sts., Seattle; Paulsen Bldg., Spokane.

W-6 **Westinghouse Lamp Co** .....
(See Westinghouse Electric & Manufacturing Co.)

W-8 **Western Pipe & Steel Co** .....
444 Market St., San Francisco; 1758 North Broadway, Los Angeles.

1916
PERIODICAL DIVISION